culties will lie. His lectures were illustrated not only by wall diagrams, prepared by himself, but by sketches on the blackboard drawn with the clear decided stroke of a master-hand whilst he was talking. He was second to none in appreciating the importance of drawing as a means of fixing the details of a structure upon the student's mind, and it was his custom to offer annually a prize for the best note-book produced by a member of the class.

In his own investigations it was his practice to begin with the illustrations, and in this way the whole of the figures in his "Vertebrate Embryology" were drawn before a line of the text was written. This power of clear exposition and his long experience as a teacher rendered him a singularly competent writer of text-books, as is evidenced by "The Frog," and "Practical Zoology," each of which has passed through several editions.

His powers as a teacher and his powers as an athlete rendered him extremely popular with the students; his advice was often sought and was valued because it was always candid, whilst his geniality and kindliness were such that his most outspoken criticism never gave offence.

It is no disparagement, however, to his powers as a scientific investigator and as a teacher, to say that his greatest distinction was his capacity for organisation, though this was as yet only known to those associated with him in administrative work; it is not too much to say that the great success which attended the Manchester meeting of the British Association was mainly due to his efforts as local secretary, whilst his services first as secretary and then as chairman of the Board of Studies rendered no small aid to the Victoria University in the early stages of its growth.

The University Extension movement in Lancashire and Cheshire loses one of its most ardent supporters. Though well aware of the necessary failings of this method of imparting instruction, he was firmly persuaded of its usefulness as a means of stimulating an interest in intellectual studies. He was an ideal Extension lecturer; his singularly lucid style enabled him to expound difficult biological problems to large popular audiences, whilst the truths he taught were indelibly impressed upon his audience by the striking and generally humorous language in which they were couched.

Marshall was elected a Fellow of the Royal Society in 1885, and served upon the Council for the year 1891–2. By his death the scientific world loses a conscientious and brilliant worker; the college and university a successful teacher and administrator; but what of those who are privileged to be his friends? He was a most stimulating influence in work, and a cheery companion in pleasure, whose geniality was never known to be ruffled by ill-temper or irritation. He concealed a deep seriousness beneath a jocular and almost boyish demeanour and phraseology, and whilst rejoicing in an unbounded flow of animal spirits himself, the sorrows of others touched him to the quick and called forth his practical sympathy. Science will progress and the college and university hold on their course but the place of our friend can never be taken by another.

NOTES.

IT is with deep regret that we announce the death of Prof. Hertz, the eminent investigator whose work marks an epoch in the history of electrical science. The information comes as a surprise to us, and we are grieved that one from whom so much more might have been expected has been cut off in the prime of his life. The gap produced in the ranks of scientific investigators by his death will not readily be filled.

PROF. P. VAN BENEDEN must be added to the list of men of science who have recently passed away, and whose loss we mourn. He has just died at Louvain, at the age of ninety-three, but his works live and will always do honour to his name. He was a member of the Brussels Academy of Sciences, and had been professor at Louvain University for nearly sixty years.

WE regret to record the death of Prof. Forchhammer, the well-known archæologist; of Prof. K. L. Michelet, Berlin at the age of ninety-two; of Dr. S. Guttmann, Geheimer Sanitäts-Rath, and editor of the *Medicinischen Wochenschrift*; and of Dr. L. Krahmer, Ordinary Professor of State Medicine in Halle University.

BY the death of Dr. George Gordon, natural history in the north of Scotland has lost one of its most enthusiastic and oldest supporters. He died at the advanced age of ninety-two years, on December 12, after working nearly three-quarters of a century in the cause of science.

A COMMITTEE of eminent men of science, art, and literature, with M. Pasteur at its head, has been formed in Paris for the purpose of raising the funds to erect a monument to the memory of the late Dr. Charcot.

DR. R. BRAUNS has been appointed Professor of Mineralogy in the Darmstadt Technical High School.

A BOTANIC garden and arboretum has been established at Buenos Ayres, by M. C. Thays.

PROF. G. SCHWEINFURTH has started on his third botanical exploring visit to the Italian colony of Eritrea, on the Red Sea.

PROF. F. DELPINO, of Bologna, has been appointed Director of the Botanic Garden at Naples, and Professor of Botany in the University.

ONE of the bequests in the will of Mr. A. Peckover, who died last month, is the sum of £100 to the Linnean Society.

MR. F. E. IVES has been awarded the Elliott Cresson gold medal of the Franklin Institute for his system of colour photography, known as composite heliochromy.

THE Society for the Encouragement of Industry in the Netherlands offer a prize equivalent to £30, and a gold medal, for the best memoir on the production of electricity by windmills. Intending competitors must send in their schemes before July 1, to the Secretary of the Society, Haarlem, Holland.

ELECTRICAL engineers have as yet been unable to perfect a system of working tramways electrically along crowded thoroughfares. Inventors have long been engaged endeavouring to overcome the difficulties, and as an incentive to them to throw themselves into their task with renewed vigour is an announcement in the *Times* that the Metropolitan Traction Company of New York City has offered the handsome award of about £10,000 for a system of street-car propulsion which will be superior or equal to the overhead trolley system, but without possessing the objectionable feature of the trolley for crowded thoroughfares.

THE Committee on Science and the Arts of the Franklin Institute has issued a circular in which attention is directed to three awards under its control. The character and conditions of these awards are, briefly, as follows:—The Elliott Cresson Medal is of gold, and may be granted for some discovery in the arts and sciences, or for the invention or improvement of some useful machine, or for some new process, or combination of materials in manufactures, or for ingenuity, skill, or perfection in workmanship. The John Scott Legacy Premium and Medal (twenty dollars and a medal of bronze) is awarded for useful inventions. The Edward Longstreth Medal of Merit is of silver, and may be awarded for useful invention, important discovery, and meritorious work in, or contributions to, science or the industrial arts. Full directions as to the manner and form in which applications for the investigation of inventions and discoveries should be made will be sent to interested persons on application to the Secretary of the Franklin Institute, Philadelphia.

In the annual report just issued by the University of Edinburgh, acknowledgment is made of several benefactions. We read that a legacy of £1000 has been bequeathed by the late Mrs. Elizabeth Trevelyan for the foundation and endowment of a scholarship in engineering and mechanical and useful arts, and another bequest, by the late Mr. George Scott, of £1000 is destined for the foundation of a scholarship in arts. Since the close of the previous academic year a handsome bequest of £5000 by the late Mr. Alexander Low Bruce, to assist in the foundation of a chair of public health, has been intimated. Of very special interest and value is a collection of Arctic and other relics and curiosities, made by the late Dr. John Rae, the distinguished Arctic explorer, along with his bust, presented by his widow.

We would call attention to a new departure in University College. During the Easter Term Dr. L. E. Hill, Assistant Professor of Physiology, will give a practical course of instruction in psycho-physiology. The course will take the student methodically over the several senses, and familiarise him with the methods by which the new branch of science known as physiological-psychology or psycho-physics determines the precise manner in which sensation varies both quantitatively and qualitatively with variations of the stimulus, of the particular portion of the sensitive surface stimulated, and so forth. This is, we believe, almost the first attempt in this country to give to students systematic laboratory instruction in those experimental methods of investigating sense-phenomena which have already borne such valuable fruit in Germany and America. As supplying an exact and practical method of measuring sensibility the course should further prove valuable to teachers and others.

The increasing interest in psychological investigation in America is shown by the establishment of many psycho-physical laboratories, and by the formation last year of the American Psychological Association, which drew to Columbia College at its second meeting, December 27 and 28, a distinguished gathering of original investigators. The programme, besides the annual address of the president, Prof. G. T. Ladd, of Yale University, included the following papers:—The psychological standpoint, by Prof. G. S. Fullerton, University of Pennsylvania; the case of John Bunyan, by Prof. Josiah Royce, of Harvard University; some account of investigations at Columbia College, by Prof. Cattell; same at Harvard University, by Prof. Münsterberg; same at Yale, by Prof. Scripture; experiments on visual memory, by Mr. H. C. Warren, of Princeton University; Do we ever dream of tasting? by Prof. J. C. Murray, of McGill College, Montreal; an early anticipation of Mr. Fiske's doctrine as to the meaning of infancy, by Prof. N. M. Butler, of Columbia College; accurate work in psychology, by Dr. E. W. Scripture, of Yale University; the problem of psychological measurement, by Mrs. G. H. Mead, of the University of Michigan; the perception of magnitude and distance, by Dr. J. H. Hyslop, of Columbia; pain and pleasure, by Mr. H. R. Marshall, of New York; pain contrasts, by Prof. Edward Pace, of Catholic University, Washington; the confusion of content and function in the analysis of ideas, by Prof. D. S. Miller, of Bryn Mawr College. Prof. James, of Harvard, was elected president for the ensuing year, and Princetown was named as the place of the meeting on December 27 and 28 of this year.

At the general meeting of the Association for the Improvement of Geometrical Teaching, to be held at University College, London, January 13, a new undertaking will be proposed by the Council, viz., the establishment of a journal of elementary mathematics, to appear three times a year, and to be specially devoted to such subjects as are usually taught in secondary schools.

A course of lectures on matters connected with sanitation will be given at the Sanitary Institute from January 26 to April 2. Among the lecturers are Sir Douglas Galton, Profs. Corfield, H. Robinson, A. W. Blyth, A. B. Hill, Dr. J. F. J. Sykes, Dr. A. Newsholme, and Dr. Hamer. The lectures have been arranged for the special instruction of those desirous of obtaining a knowledge of the duties of sanitary officers.

On Tuesday next (January 16), Prof. Charles Stewart, the newly elected Fullerian Professor of Physiology in the Royal Institution, will begin a course of lectures on "Locomotion and Fixation in Plants and Animals." The Friday evening meetings will begin on January 19, when Prof. Dewar will discourse on the "Scientific Uses of Liquid Air."

The annual general meeting of the Royal Meteorological Society will be held on January 17, when the report of the council will be read and the election of officers and council for the ensuing year will take place. The president of the society will deliver an address on "The Climate of Southern California."

A period of very severe weather has recently been experienced over these islands and the whole of Western Europe. On the 1st inst. an anticyclone lay over Scandinavia, and subsequently spread over the northern parts of this country, causing frost in many places, while snow showers occurred in England, accompanied by bitter easterly gales. For some days the frost and snow contiuued with increased intensity. The reports issued by the Meteorological Office show that on the morning of the 6th inst. the minimum temperature in South London fell to 13°, while on the previous day a temperature of 16° was recorded at Jersey, being 22° below the average minimum for January, and at Biarritz a reading of 14° was recorded on the 4th, being 20° lower than the reading at Bodö in Norway, within the Arctic Circle. Towards the end of the week the easterly gales had subsided in the south-east, but had spread to the northern parts of the kingdom. On Saturday morning the Meteorological Office reported a temperature of 5° in the Midland Counties and 6° in the centre of Ireland, but later information in the *Weekly Weather Report* shows that the absolute shade minimum recorded was minus 4° at Braemar and in the Midlands on that day. With reference to the temperature in the north-west of London, Mr. Symons recorded 13°·1 on the 5th, and a maximum temperature of 18°·4. His long series of observations shows that the severity of the night of the 4th and 5th was only exceeded three times in the last thirty-five years, viz. December 25, 1860, January 4, 1867, and January 17, 1881 (the day preceding the blizzard); while as regards the maximum, there has been only one day as severe during the same period, viz. January 4, 1867, when the temperature did not exceed 16°·9. The frost continued until the morning of the 8th, when a deep depression appeared off the south-west of Ireland, causing southerly winds and a considerable rise of temperature, and by Monday evening a thaw had set in generally.

Owing to delay at the Government Printing Office, Mr. H. C. Russell, the Government Astronomer for New South Wales, has only just been able to issue the results of rain, river, and evaporation observations made in that colony in 1892. In addition to the usual matter, the report contains the results of an attempt to determine the average rainfall of Australia. It will be many years before the rainfall of Australia will be measured in all parts, but taking the values already obtained, and weighing them in proportion to the area of each colony in which they were made, the average annual value of the rainfall for the whole of the mainland of Australia comes out as 21·15 inches. Another matter which Mr. Russell has investigated is the effect of altitude upon temperature. In works of reference it is usually stated that a rise of 300 feet causes a fall of 1° Fahr., but this quantity must evidently vary with the locality. A comparison of the average temperatures at ten different places with that of Sydney, making an allowance at the rate of 1° Fahr. for a difference of one degree of latitude, gave 344 feet as the mean elevation required to produce a fall of 1° Fahr. The report concludes with an average rainfall map, constructed on the plan described in these columns on December 21; a new rainfall map for the year; a map showing the monthly distribution of rain over each square degree of New South Wales, and curves showing the height of the western rivers of that colony throughout 1892.

THE *Transactions* of the Devonshire Association for the Advancement of Science for 1893 contain a good account of the climate of Torquay, by A. Chandler, from trustworthy instruments. This health resort is favoured by a large amount of sunshine; dividing the year into two periods the summer has an average of 43·4 per cent., and the winter 30·5 per cent. of the possible amount. The average mean shade temperature is 50°·2, and the mean annual range 11°·4. The mean temperature of summer is 56°·5, and of winter 43°·8. The highest summer temperature during the year 1892 was only 78°·2, and the lowest winter temperature was 22°·4. The mean annual rainfall for twenty-five years, 1864–88, was 37 inches; June is generally the driest month, with an average of about 2 inches, and January the wettest, with a mean of a little over 4 inches. The prevalent winds are warm, being from south-west, and the town enjoys great freedom from storms. The observations are now organised and provided for by the Town Council.

WRITING upon the persecution of the Great Skua (Stercorarius Catarrhactes) in the *Annals of Scottish Natural History* for January, Mr. W. E. Clarke points out that a fact worth remembering in the history of those birds which have become extinct within the present century, is that their extermination had, in all instances, become an accomplished fact for several years before such was realised to be the case. In order to lead ornithologists to do something to prevent the Great Skua from a similar fate, Mr. Clarke gives an account of the persecution to which the bird is subject, and the wholesale stealing of its eggs. The evidence he brings forward shows that unless some measure of protection is immediately afforded to the Great Skua, this fine bird must soon cease to exist in Europe.

MISS E. A. ORMEROD contributes to the *Times* of Monday some observations on insect attacks upon crops and trees in this country during last year. She points out that the attacks of the year were much influenced by the exceptional deficiency of rainfall in the early half of 1893, from March onwards, and by other weather peculiarities. With regard to the imported locust appearances, the specimens which reached her alive proved to be of a South European species, which is not gregarious, and in its own country, though of large size, is known to do no appreciable damage. From the climatic requirements of locusts, therefore, and also from recorded experience, there does not appear to be any reason to fear even a possibility of locusts effecting a settlement in this country. It is pointed out by Miss Ormerod, however, that the presence of locusts in great quantities in fodder might be detrimental to the health of animals fed upon it.

ANOTHER note on locusts, more or less connected with the above, is contained in a statement recently issued by the Government of India (*Agricultural Ledger Series*, No. 2, 1893). Dr. Günther suggested to the Government, some time ago, that dried locusts might be used for insectivorous cage-birds and game-birds which are now reared at great expense upon ants' eggs. His letter was submitted to Mr. E. C. Cotes, of the Indian Museum, Calcutta, who has reported favourably upon it, but thinks there would be a difficulty in keeping up the supply from India at the present time. But though the invasion of India by the locust *Acridium peregrinum*, Oliv., is now practically at an end, Mr. Cotes says that Northern Africa, which was badly invaded in 1892 by the same insect, and is still infested, might offer a favourable ground for experiment.

THE silk-spider of Madagascar forms the subject of an interesting article in *Die Natur*, by Dr. Karl Müller. Its native name is Halabé, meaning great spider. This Halabé, or *Nephila Madagascariensis*, spins threads of a golden colour, and strong enough, according to Maindron, to hang a cork helmet by. The female spider may attain a length of 15 c.m., while the male does not exceed 3 c.m. A single female individual, at the breeding season, gave M. Camboué, a French missionary, some 3000 m. of a fine silken thread, during a period of about twenty-seven days. The thread was examined with a view to creating a new industry. Specimens tested at a temperature of 17° C. showed an elongation of 12·48 per cent. under a weight of 3·27 gr. Small textures woven of these threads are actually used by the natives for fastening flowers on sunshades, and for other purposes.

PROF. J. WIESNER, who has recently been studying the influence of artificial rain upon European and exotic plants, gave an account of his results at a recent meeting of the Vienna Academy. Some of the plants, called by Prof. Wiesner *ombrophobe*, can only for a short time stand continuous rain, and soon shed their leaves and decay. Others, called *ombrophil*, can stand it for months together. Plants growing in dry places are, as a rule, ombrophobe, but the reverse cannot be said of plants growing under wet surroundings. Leaves appear to gain in power of resisting rain as they develop, and to reach a climax in this respect at the period of their greatest vital activity, after which they lose much of that power. Leaves which can be wetted by water are usually ombrophil, those which cannot are usually ombrophobe, but in cases where leaves are both ombrophobe and easily wetted, they are extremely sensitive to rain. Prof. Wiesner thinks that ombrophobe leaves are enabled to resist the putrefactive action of water, especially at high temperatures, by certain antiseptic substances which they contain. The same may be said of hydrophil roots and submerged parts of aquatic plants.

THE edible lichen of Japan, known as "iwatake," is described in the *Botanisches Centralblatt* (1893, No. 45) by Dr. M. Miyoshi, under the name *Gyrophora esculenta*, sp.n. Its commercial value is due to the large amount which it contains of starch and of some gelatinous substance; and it is also extensively used in Japanese cookery as a condiment, having a pleasant flavour and being free from purgative properties. In some parts of Japan, especially the mountainous districts, it completely covers the moist granite rocks. After drying it is sent into the towns, and a large quantity is annually exported.

IN a recent number of the *Electrical World* (of New York), Lieut. F. Jarvis Patten has described a novel method of obtaining sinusoidal alternating currents of very low frequency. The apparatus, which the inventor calls a "liquid commutator," consists of a circular vessel, provided with two conducting electrodes fixed at the opposite extremities of a diameter. A continuous current is passed from one of these electrodes to the other, through the liquid contained in the vessel, the strength of the current being controlled by an internal resistance. A vertical spindle at the centre of the trough carries a revolving arm provided with conducting plates or electrodes at its extremities. These plates are insulated from one another, and are connected to two ring contacts carried by the central spindle. Two brushes bear on these rings, and convey the alternating current. By suitably altering the connections and electrodes, it is possible in the same manner to obtain multiphase currents. The author finds that the currents obtained are practically sinusoidal, and he suggests that they will be of considerable physiological use.

AT a recent meeting of the Société Francaise de Physique, M. Hurmuzescu showed some experiments on electrical convection in air. He finds that if you cause dissymmetry between the two discharging knobs of a Wimshurst electrical machine, by fixing a point to one of them, then, on placing a sensitive gold-leaf electroscope at a distance of about two metres, when the machine is worked, the discharging knobs being separated, the electroscope becomes charged. The electroscope becomes more highly charged when it is fitted with a point than when it has only a varnished ball at the end of its electrode. That the charge is not due to induction, but to convection through the air, is shown by the fact that the interposition of a metallic screen does not interfere with the effect, while if the electroscope is covered over by an insulating shade no electrification is observable. In addition, it is found that the charge on the electroscope is of the same sign as that of the terminal of the machine on which the point is fixed. The most marked and rapid results are obtained when the point on the machine is negatively electrified, while no effects are observed if the point is turned towards the plates of the machine.

AN account of Victor Schumann's successes in photographing rays of very short wave-lengths is given in No. 50, of the *Naturwissenschaftliche Rundschau.* These successes are entirely due to the elimination of absorption by the material used in the prisms and lenses and, what is especially noteworthy, of the layers of air intervening between the luminous source and the plate used for photographing the spectrum. This elimination has resulted in the exhaustive exploration of the hitherto doubtful ultra-violet region between 231·4 and 185·2 μμ, and the annexation of the region down to 100 μμ to the known spectrum. For this it was necessary to get rid of the absorption due to the film of gelatine in which the sensitive silver salt was embedded, and this was accomplished by the substitution of a pure silver bromide plate. The camera, the spectroscopic apparatus, and the spark tube were all connected together and exhausted. The very first exposure on the hydrogen spectrum showed that the known radiations of that gas only represent a portion of its total radiance. The newly-traced portion turned out to be extremely rich in lines, with a maximum at about 162 μμ, and consisted of fifteen groups of lines disposed pretty evenly, containing altogether about 600 lines, with intensities decreasing from the maximum in both directions, rapidly at first, and then very gradually. The wave-lengths of these lines are as yet undetermined. Provisionally, that of the smallest wave-length recorded is estimated at 100 μμ. The spectra of aluminium, cadmium, cobalt, and other metals end at about 170 μμ. A layer of normal air 1 mm. in thickness appears capable of absorbing all radiation of smaller wave-length than that. Dry gelatine absorbs eagerly all waves beyond 217 μμ,. Quartz is not suitable for prisms and lenses, and white fluor-spar is, so far, the only material that answers all requirements. The accurate determination of the new wave-lengths, the further investigation of the absorption due to air, and the further extension of the ultra-violet region, are the problems which Herr Schumann is now working at.

IN a note published in NATURE on July 20, attention was drawn to the manner in which the virulence of the typhoid bacillus may be increased by the products of other organisms being inoculated along with it into animals. In an elaborate paper, recently published in the *Annali dell' Istituto d'Igiene di Roma*, vol. iii. 1893, p. 117, Roncali shows how the virulence of the tetanus bacillus may be intensified by similar means. Thus an animal inoculated with this organism usually succumbs in three days; if, however, the soluble products of this bacillus be accompanied with those of some other organism, death ensues with tetanic symptoms in from 12–26 hours. It was also found that if by some means or other the power of resistance inherent in the animal was first diminished, the action of the tetanus toxine was greatly accelerated. This condition of diminished resistance was obtained by either first inoculating some other organism, or by introducing putrid infusions of meat or vegetables in themselves proved to be perfectly harmless to the animal in question. To further illustrate this point, symptoms of chronic tetanus were induced in animals by the inoculation of the soluble products of the tetanus bacillus obtained after from 3–4 days' growth. After from 8–10 days, if pathogenic or non-pathogenic organisms were introduced, the animals died in from 16–18 hours, whilst if they were not subsequently interfered with, they usually recovered in from 20–35 days. In the course of these investigations the interesting discovery was made that the bacillus of rabbit septicæmia, which is usually non-pathogenic to mice, may be rendered fatal to the latter by cultivation on agar-agar containing the soluble products of the tetanus bacillus. These experiments indicate how harmless saprophytes, such as the *b. prodigiosus*, may under given conditions become the servants of disease organisms, either by diminishing an animal's power of resistance, and so preparing the way for the entrance and work of pathogenic bacteria, or by hastening the lethal action of the latter by subsequent intrusion into the system of the infected animal.

WE have received three fascicules of the forthcoming volumes of the *Memoirs* (*Zapiski*) of the Russian Geographical Society. One of them contains D. Pokotilov's elaborate paper, "U-tai, its Past and Present," given to the description of the holy mountain of the Buddhists and its numerous monasteries. M. Pokotilov has followed the same route as Dr. Jos. Edkins ("Religion in China"), and also describes his journey from Pekin to the U-tai Mountain; but he also gives a detailed description of the Buddhist sanctuary, and the history of the development of Buddhist monasteries at this spot. The learned Russian scholar has utilised, moreover, the Chinese works devoted to the same subject. Taken in connection with Prof. Pozdneev's large work, "Sketches of the Life of Buddhist Monasteries and Buddhist Clergy," lately published in the *Memoirs* of the same Society (Ethnography, vol. xvi., 1887), M. Pokotilov's paper is a very valuable addition to the literature of the subject. Another fascicule of the *Zapiski* (Geography, vol. xv. No. 3) contains F. Schwartz's report on his astronomical, magnetical, and barometrical observations in Bokhara, Darvaz, Karateghin, and Russian Turkestan, made in 1886. A third fascicule (Statistics, vol. vii. No. 2) contains a detailed description of the Eritrean colony of Italy, by M. A. Troyansky.

THE Physical Society of London has just issued the third part of vol. xii. of its Proceedings.

THE first part is published of the new *Flore de France* (including Corsica and Alsace-Lorraine), by MM. G. Rouy and J. Foucaud.

WE have received No. 8 of the first volume of "Contributions from the U.S. National Herbarium." It is chiefly occupied by the description of American grasses, a large number of new species being described.

THE current number of the *Asclepiad* (vol. x. No. 39), edited by Sir B. W. Richardson, F.R.S., contains a good account of the works of Robert Boyle, and an autotype of that eminent investigator, from an engraving by R. Woodman.

THE second edition of Clowes' and Coleman's "Quantitative Analysis" (J. and A. Churchill) is about to be issued. The authors have thoroughly revised the book, and have introduced many recent modifications in processes, as well as new methods of analysis.

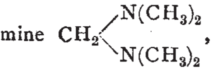
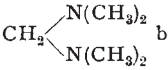
THE *Journal of the Royal Statistical Society* (part iv. vol. lvi.) has been received by us. It contains, among other papers, the presidential address delivered by Mr. Charles Booth in November last, and that given by Prof. Nicholson before the Economic Science and Statistical Section of the British Association at the Nottingham meeting.

WE have received "Eau Sous Pression," by M. F. Bloch, being a new volume in the Aide-Mémoire Series published by Gauthier-Villars, Paris. The early chapters in the book are devoted to enunciating hydrostatic and hydrodynamic principles, and stating the general theory of pumps, hydraulic rams, and accumulators. The subject is then treated from a practical point of view. The book contains thirty illustrations in the text, and does credit to an excellent series.

The Technical Instruction Committee of the County Council of Cumberland has issued a Directory of the Science and Art Classes, &c., under its control. We learn from this source that the average attendance of students at science classes held under the committee's jurisdiction is 1328. The subject that obtains the highest average is theoretical chemistry; then come agriculture, mathematics, plane and solid geometry, and physiography. Sound, light, and heat shows, by far, the lowest number of students, the average attendance for the whole county being only eight.

THE third volume (Series 3) of the *International Journal of Microscopy and Natural Science* has been published. The journal is the organ of the Postal Microscopical Society of London, which has for its object the circulation, study, and discussion of microscopic objects. The volume just received contains a large amount of information of use to microscopists, and several excellent papers, notably one on polarised light and its applications to the microscope, by Mr. G. H. Bryan, and a translation from *La Diatomiste* of Dr. Miquel's long article on the artificial cultivation of diatoms. The journal is well illustrated and does credit to the society the proceedings of which it reports. We have noticed two misprints, one on p. 8, where "Leek" is printed instead of Lick, and on p. 69 "Wills" is printed instead of Wells.

A USEFUL series of "Handbooks of Commercial Products" has been provided to the Imperial Institute by the Government of India. The books contain descriptions of the economic products of India, and among several of them recently received is one on Indian coal, in which a large number of facts concerning the geology and working of the coal districts are brought together. The iron resources and iron industries of the southern districts of the Madras Presidency are described in another of the handbooks, the account being accompanied by a plate showing the process adopted for the manufacture of wrought iron. The furnace employed is roughly circular in horizontal section, four feet high, two feet in diameter at the base, and only nine inches in diameter at the throat. Two other handbooks of interest to us summarise the present state of knowledge concerning the characters and occurrence of Indian micas and steatite.

A NUMBER of new reactions of formaldehyde, resulting in the preparation of several new compounds, are described by M. Henry in the *Bulletin de l'Académie Royale de Belgique.* This lowest number of the series of aldehydes, HCHO or $O=CH_2$, appears to be endowed with very considerable chemical energy, as indicated by the readiness and frequently the violence with which it reacts with a large number of substances. The reactions now described are those which occur between formaldehyde and the primary and secondary amines. If a solution of methylamine is added to one of formaldehyde, in small portions at a time, a very energetic reaction occurs with evolution of so much heat that great loss occurs unless the vessel in which the operation is performed is surrounded by a freezing mixture. When the reaction is complete, the two substances being then present in equivalent quantities, the addition of solid potash precipitates methyl methylenamine, $H_2C=N-CH_3$, from the solution. This substance is readily purified, and proves to be a colourless mobile liquid, readily soluble in water, and boiling at 166°. At the temperature of a freezing mixture of ether and solid carbon dioxide it solidifies, and may be melted again at $-27°$. The ethyl compound may be similarly obtained, and is likewise a liquid; it boils at 207–208°, and melts after solidification by ether and solid carbon dioxide at $-45°$. Two molecular equivalents of dimethylamine react with even greater avidity in aqueous solution with one molecular equivalent of formaldehyde, and the reaction can only be safely carried out at a very low temperature. The product is tetramethyl methylenediamine  $CH_2\begin{matrix}\diagup N(CH_3)_2\\ \diagdown N(CH_3)_2\end{matrix}$, a colourless and very mobile liquid which fumes strongly, dissolves in water, and boils at 85°. Ether and solid carbon dioxide will not solidify it. The tetraethyl compound, prepared in an analogous manner, is also a fuming liquid; it boils at 168°. All these compounds are insoluble in strongly alkaline liquids. They readily absorb water, like the amines, formaldehyde and the substituted ammonia being regenerated. A somewhat curious fact is observed in connection with the boiling-points. Methyl methylenamine $CH_2:NCH_3$ boils at 166°, and methyl isocyanate $CONCH_3$, the analogous oxygen compound, at 43°; so that the replacement of two atoms of hydrogen by one of oxygen is accompanied in this case by a reduction of the boiling point by 123°. On the other hand, while the compound  $CH_2\begin{matrix}\diagup N(CH_3)_2\\ \diagdown N(CH_3)_2\end{matrix}$ boils at 85°, the corresponding oxygen compound tetramethyl urea boils at 177°, nearly a hundred degrees higher.

IN a further communication to the *Bulletin* of the Belgian Academy, M. Henry describes a new mode of preparing halogen substitution products of the oxides (ethers) of the alkyl radicles. The monochlorine derivative of methyl ether $CH_2Cl\cdot OCH_3$ was prepared in 1877, by Friedel, by chlorination of the ether. It is now shown to be much more readily obtained by mixing a concentrated aqueous solution of formaldehyde with methyl alcohol and saturating the cooled solution with hydrochloric acid gas. The compound separates as a colourless liquid layer at the surface of the solution, and by distillation the pure substance is at once obtained, boiling at 60°. The monobromine derivative may be obtained in a precisely similar manner, and proves to be a pungently-fuming liquid, boiling at 87°. The iodine compound is also afforded by the analogous reaction with hydriodic acid, the pure liquid boiling at 124°, but, in addition, the di-iodine derivative $CH_2I{\cdot}O{\cdot}CH_2I$ is simultaneously formed. Incidentally M. Henry observed that phenol reacts in a most violent manner with formaldehyde, great heat being evolved, and a remarkable porcelain-like substance being produced which is insoluble in all the usual solvents.

THE additions to the Zoological Society's Gardens during the past week include a Black-handed Spider Monkey (*Ateles ater*, ♀) from Eastern Peru, presented by Mr. L. Clarke; a Coot (*Fulica atra*) European, presented by Mrs. L. Spender; two Wedge-tailed Eagles (*Aquila audax*) from Australia, presented by Mr. F. W. Burgess; a Long-billed Butcher Bird (*Barita destructor*) from New Holland, deposited; a Salvin's Amazon (*Chrysotis salvini*) from South America, two Purple-capped Lories (*Lorius domicella*) from Moluccas, purchased; a Yak (*Pœphagus grunniens*) born in the Gardens.

OUR ASTRONOMICAL COLUMN.

HARVARD COLLEGE OBSERVATORY REPORT.—In this, the forty-eighth annual report to the President of the University, Prof. Pickering, the director of the Astronomical Observatory of Harvard College, has a fine record of work to refer to, which has been carried out during the twelve months ending October 31, 1893. We make the following brief extracts from the accounts given of the various branches of work done in the several departments. The East Equatorial was on the whole worked by Mr. O. C. Wendell, and employed for the systematic observation of variable stars upon the system lately adopted. Photometric observations of Jupiter's satellites (twenty-five in number) were made; forty-eight series of wedge photometer observations (3354 measurements) for determining the brightness of 1118 stars occurring in the Durchmusterung, were also made. Among other uses of this instrument were the observations of comets, measurements with the polarising photometer, &c. The Meridian Circle has been, as usual, at work under the direction of Prof. W. Rogers, while good progress has been made in the reductions of the observations of the southern stars with the meridian photometer. The observing list for the latter observations contains about 6000 stars, and excluding the 4000 already contained in the Harvard Photometry, three quarters have now been made. Mr. W. Reed, with the West Equatorial, on eighty-seven evenings has made observations on variable stars (489), comparison stars (1318), and ten on the brightness of Comet Holmes.

With regard to the Henry Draper Memorial, Mrs. Fleming has given us, as usual, her list of stars with peculiar spectra, and her examination has resulted in the discovery of the new star in Norma. In addition to a classification of the 20149 spectra of stars for the new catalogue, work has been done with the 8-inch and 11-inch, resulting in the production of 2424 and 1037 photographs respectively. A most interesting series (213 photographs) of β Aurigæ has also been obtained.

In the Boyden Department, in addition to an expedition to observe the total solar eclipse in April last, important work was done by the 13-inch telescope, which was devoted to a study of the members of the solar system, an account of which has been previously referred to in this column. Prof. Bailey, the director of the third expedition, began work on April 4, and with an 8-inch and 13-inch telescope has obtained 1516 and 852 photographs with these two instruments respectively; some of these pictures show some very remarkable southern clusters. This observatory has also a meteorological station on Mount Chachani, 16,650 feet, the highest in the world; a second one has now been established on the volcano El Misti, at an elevation of 19,200 feet, with self-recording instruments. The Bruce photographic telescope will now be soon completed and ready for work, but the Bruce transit photometer has already made some progress towards the observations of tenth magnitude stars as standards for faint stellar magnitudes. Zodiacal phenomena have also been systematically observed. The new brick building for the thirty thousand glass photographic plates is finished, and the plates have been transferred. In his concluding remarks Prof. Pickering alludes to the difficulty, now becoming more and more significant every year, with regard to the observation of faint objects, owing to the increasing number of electric lights in the neighbourhood. An "electric tram" trouble seems also approaching a focus in the near future. We hope Prof. Pickering will successfully override these difficulties.

THE "GEGENSCHEIN."—In order to find out the origin of this peculiar phenomenon an effort has been made to obtain observations as nearly contemporaneous as practicable, and made at widely separated points. The distribution of light in the zodiac, and particularly of the slight maximum nearly opposite the sun, and known as "Gegenschein," or Counter-glow, has for some time past attracted the attention of astronomers, and we hope the present systematic attempt will be rewarded with successful results. Those cooperating in this work are Prof. Barnard, of the Lick, Prof. Bailey at Arequipa, Prof. Searle and Mr. Reed at Strafford, Vermont, and Mr. Douglass at Cambridge, U.S.A. Prof. Barnard, after describing the general appearance of this phenomenon (*Astr. Journal*, No. 308), besides noticing the change of form and its connection with a zodiacal band, finds that his observations show that the "Gegenschein" lags behind exactly opposite the sun, or, in other words, that its longitude is not quite 180° greater than that of the sun. His numbers are:—

From	λ—⊙.	β.	No. obs.
1883–1887	179·4	+0°·4	16
1888–1891	179·4	+1°·3	16
Sept. and Oct. 1893	179·6	+0°·5	22

His observations show no decided parallax to the object, but an appreciable north latitude, as seen from the value of β in the table above, will be noticed.

Prof. Barnard believes that the latitude of the "Gegenschein" and the lagging in longitude to be due to "atmospheric absorption, and that the object is exactly opposite the sun, and that it lies in the ecliptic, and if its centre were a definite point the position of the sun could be accurately determined from observations of the 'Gegenschein' by changing the sign of the declination and subtracting twelve hours from the Right Ascension."

GEOGRAPHICAL NOTES.

THE Arctic expedition planned by Dr. Stein, of the U.S. Geological Survey, as the first of a series for the gradual exploration of the Arctic regions from a base in Ellesmereland (see NATURE, vol. xlix. p. 18), is being actively prepared. According to Reuter's agency the command of the expedition has been offered to Baron Nordenskiöld, who has contributed £250 to its fund and has arranged by cable to keep a place open for a Swede on the staff. Dr. Stein has agreed to the latter proposal, and has stated that his first duty will be to search for the Swedish naturalists Björling and Kalstennius, whose tragic story has been briefly told in this column (p. 85). The possibility that the unfortunate party was able to reach the Eskimo of Ellesmereland and live with them for two years is very slight, but as long as the faintest chance remains it is satisfactory to find that arrangements are being made for a search and possible succour.

M. E. A. MARTEL, whose researches on the subterranean watercourses of France and Greece are well known, has been investigating the Adelsberg Grotto and other *karst* phenomena of Carniola, in company with Herr Putick. They were able to solve conclusively some points in the hydrology of the river Piuka, and found their way into parts of the Adelsberg cavern never before reached, proving that the whole length of the underground passages in connection with it is not less than 10 kilometres.

WITH the publication of vol. xix., dealing with South America, M. Elisée Reclus' great work, "Nouvelle Géographie Universelle: La Terre et les Hommes," has been completed. Twenty years have elapsed since the first volume was published, and these years have seen immense advances of geographical knowledge; but by the device of treating the less known continents at the end of the work, it has not fallen seriously out of date. Its great features are the philosophic grasp of the relation of man to his natural surroundings, and the working out of this relation for each continent and country. It is unfortunate that the state of public feeling on the continent makes it impossible for the University of Brussels to carry out the appointment of M. Reclus to a professorship there (see NATURE, vol. xlvii. p. 327 on account of his political views.